

CLAIMS

1. Process for the preparation of synthesis gas by catalytic steam and/or CO₂ reforming of a hydrocarbon feedstock comprising the following steps:

- (a) heating the reaction mixture of hydrocarbon feedstock and steam and/or CO₂ in the flue gas containing waste heat section from the fired tubular reformer
 - (b) adiabatic reforming of the reaction mixture outside the waste heat section by contact with a solid reforming catalyst
 - (c) repeating steps (a) and (b) until the desired reaction mixture composition and temperature is reached
 - (d) feeding the reaction mixture to the fired tubular reformer and further reforming the mixture to the desired composition and temperature,
- wherein the adiabatic reforming of the reaction mixture is conducted in the process gas piping system in the flue gas-containing waste heat section, the piping system having adiabatic zones outside the heating section and containing solid reforming catalyst comprising one or more catalysed structured elements.

2. Process according to claim 1, wherein the reaction mixture of hydrocarbon and steam and/or CO₂ is pre-reformed prior to heating step (a).

3. Process according to claim 1, wherein the structured element is cross-corrugated.

4. Process according to claim 1, wherein the structured element is a monolith.

5. Process according to claim 1, wherein the structured element is a high surface structured element.

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6. Process according to claim 1, wherein the solid reforming catalyst is in adiabatic zones in the header system feeding and collecting process gas to and from a heating coil.

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7. Process according to claim 1, wherein the solid reforming catalyst is in adiabatic zones of the coil tubes and/or in the tube-connecting elements.

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8. Process according to claim 1, wherein the process gas piping system located inside the flue gas-containing waste heat section contains solid reforming catalyst.

9. Apparatus for the preparation of synthesis gas according to claim 1 comprising the following:

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(a) an adiabatic pre-reformer for optional pre-reforming of a mixture of hydrocarbon feedstock and steam and/or CO₂

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(b) a fired tubular reformer with a flue gas-containing waste heat section for heating of a mixture of hydrocarbon feedstock and steam and/or CO₂ or of the pre-reformed mixture

(c) a process gas heating coil integrated in the flue gas-containing waste heat section

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(d) a steam reforming unit system outside the waste heat section,

wherein the steam reforming unit system is integrated in the process gas piping system of the piping system of the heated coil system in the flue gas-containing waste heat section, the piping system having adiabatic zones outside the heating section and containing solid reforming catalyst comprising one or more catalysed structured elements.

10. Apparatus according to claim 9, wherein the solid reforming catalyst is in adiabatic zones in the header system feeding and collecting process gas to and from the heating coil.

11. Apparatus according to claim 9, wherein the solid reforming catalyst is in the adiabatic zones of the coils and/or the tube-connecting elements.

12. Apparatus according to claim 9, wherein the process gas heating coil situated in the flue gas-containing waste heat section contain a solid reforming catalyst.